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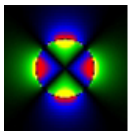
Magnet Division Procedure

Procedure: SMD-AGS-3005

Revision: A



Superconducting Magnet Division

AGS Snake Magnet Pre-Insertion Electro-Mechanical Assembly

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Revision History

Rev A: Initial Release

1 Scope:

This procedure describes the electro-mechanical work to be performed prior to the insertion of the cold mass into the vacuum vessel. The steps necessary for attaching the upper & lower buffer volumes to the containment shell, completing the wiring within the end volumes, closing the end volumes, and completing the pressure welds on the cold mass are described. Appropriate tests and inspections are outlined as well.

2 Applicable Documents:

RHIC-MAG-Q-1000	Procedure for Control of Measurement Test Equipment
RHIC-MAG-Q-1004	Discrepancy Reporting Procedure
RHIC-MAG-R-7227	Electrical Resistance Measurements
RHIC-MAG-R-7228	Coil Inductance & Q Measurements
RHIC-MAG-R-7242	Hypot Testing
BNL Dwg. 12019042	AGS Cold Snake Magnet Wiring Diagram
RHIC-MAG-R-7243	RHIC Low Precision Resistance /Continuity Insulation Test
RHIC-MAG-R-8853	Hypot Testing – Helical Coil Insulation Assembly
BNL Dwg. 22010400	Electro-Mechanical Pre-Insertion Assembly

3. Requirements:

3.1 Material & Equipment

Hypot tester and RLQ tester	
Black Felt Tip Pen	BNL Stock No. S-23757
Tie Wrap	BNL Stock No. A-59829
Insulated Gloves	BNL stock No. K-63028
Low Power Soldering Iron	

3.2 Safety Precautions:

3.2.1 Operators shall wear:

- Disposable gloves while handling acetone or ethanol.

NOTE

Latex gloves only give marginal protection to most solvents used and should only be considered as protection from incidental contact/exposure. If the glove is contaminated, it should be removed and a new glove put on.

3.2.2 Some of these electrical test procedures have specific safety requirements. The technicians performing these specific tests shall rigorously follow all the safety requirements listed as well as those prescribed by the BNL ES&H standard.

3.2.3 The technicians shall be instructed by their cognizant technical supervisor in the operation of the required test equipment and these electrical testing procedures. They shall be familiar with the latest revision of the applicable documents referenced in section 2. In addition, some of these tests require the technician to have special training. A list of qualified personnel shall be maintained with the training coordinator.

3.2.4 Hypot testing poses a Class "C" electrocution hazard. At least two properly trained technicians must be present to perform this testing. When testing, a trained technician shall be stationed at any point the item under test is accessible to unauthorized people, and barriers shall be set up. Signs shall be posted reading "DANGER HIGH VOLTAGE" and warning lights shall be turned on.

3.2.5 Specific steps of this procedure contain electrical and mechanical assembly operations that impact the environment. Prior to performing these steps, personnel shall complete the applicable facility-specific environmental training.

4 Procedure:

4.1 Installing Upper Buffer Assembly

4.1.1 Install the fill tube assembly, P/N 22010325, inside the upper buffer from underneath, by slipping the guard tube through the 1.00 inch hole located near the center of the top wall of the buffer. The fill tube assembly must be rotated a bit to allow the small vacuum tube extending horizontally from the guard tube to fit through the side wall of the buffer.

4.1.2 Locate the guard tube at the proper height within the buffer in accordance with drawing 22010400. It should be suspended within the buffer when located on the cold mass, not resting on the cold mass shell. Mark the outside of the guard tube at the point where it exits vertically from the upper buffer wall, for later reference. Leave the parts loose; DO NOT weld any part of the fill tube assembly into place at this time. Hold it inside the upper buffer using tie wraps around the buffer.

4.1.3 Uncoil the group of leads at the lead end of the upper buffer.

4.1.4 Carefully feed the wiring through the triangular hole in the shell at the lead end of the cold mass assembly. Keep the lead bundle together and located toward the centerline of the magnet, not toward the sides of the hole, because two level probes also must fit within this hole without chafing. (The level probes will be near the sides of the hole)

4.1.5 Carefully lower the buffer onto the shell while guiding the leads through the hole at the lead end and aligning the bottom of the guard tube through the shells at the non-lead end. The guard tube must protrude slightly through the lower shell at the non-lead end. Remove the tie wraps. Seat and position the upper buffer on the shell as indicated on drawing 22010400.

4.1.6 Tack weld the upper buffer in position at the lengthwise quarter points only.

4.1.7 Pull the fill tube assy up until the alignment mark made previously on the guard tube is in the correct location relative to the top surface of the buffer. Tack weld the fill tube assy into place at this mark and at the insertion point in the lower shell. Do not complete the weld at this time.

4.2 Electrical Wiring – Lead End Volume

4.2.1 Referring to schematic drawing 12019042, connect the (3) 400A leads, the (4) 50A leads, the (8) temperature sensor leads, and the (4) warm-up heater leads to their respective terminals on the board.

4.2.2 Referring to schematic drawing, connect all the “IFS A” and “IFS B” wiring to the respective terminals on the board in the end volume.

4.2.3 Install the (2) temperature sensors on the end plate. These two sensors have metric threads.

4.2.4 Connect the temperature sensor leads to their respective terminals on the board.

4.2.5 One at a time, remove the screws holding the terminal board to the standoffs on the end plate and replace them with male/female standoffs.

4.2.6 Mount the level probes on the inside surface of the terminal board cover plate. Dress the leads down the side of each probe and tie them securely as shown on drawing 22010237.

4.2.7 Locate the cover board as close to the face of the terminal board as is practical while still being able to work inside. Temporarily clamp the board in this position. Connect the level probe leads to their respective terminals on the board, removing excess lead length prior to soldering.

4.2.8 Carefully place the terminal board cover plate in place, guiding the tops of the level probes into the box on top of the buffer volume. Make sure the level probe leads are properly dressed into place to avoid kinks, chafing, etc. Fasten the cover board to the standoffs.

4.2.9 Install the warm-up heater switch assembly and its mount on the upper buffer at the lead end.

4.2.10 Connect the warm-up heater wires to the feedthrough terminals on the side of the buffer.

4.2.11 Perform electrical testing per Appendix 1.

4.2.12 Cognizant Electrical Engineer to review test data and sign-off "OK to proceed".

4.3 Welding

4.3.1 Make the final mechanical weld of the vertical guard tube to the upper buffer. (NOTE: this is not a pressure weld)

4.3.2 Make the final seal weld of the guard tube to the outside of the lower shell.

4.3.3 Place the cover washer over the vacuum tube that extends through the upper buffer side wall. Seal weld the washer to the tube and to the buffer wall.

4.3.4 Position the cold mass bottom side up. Take precautions to avoid damage to the upper buffer assembly, the warm-up heater switch, and the fill tube.

4.3.5 Position the lower buffer volume on the lower shell. Tack weld in place at the quarter points.

4.3.6 While monitoring magnet deflection, begin the seal welding of the lower buffer volume to the shell using two welders that remain in step with each other. DO NOT WELD THE LAST 5.5 INCHES OF THE BUFFER VOLUME AT EITHER END until after the end volume plates are installed and welded. If deflection during the welding process exceeds .125 inches, stop welding, rotate magnet 180º, and begin welding upper buffer volume in same manner.

4.3.7 Continue welding the upper (and lower, if applicable) buffer volume (but NOT the last 5.5 inches at either end) while monitoring and controlling deflection.

4.3.8 Install the two end volume plates, but do not weld yet. Tap the plates in only enough to obtain the proper distance from each plate's surface to the magnet's true center, and to obtain the overall length of the cold mass. Be certain the plates are also perpendicular to the longitudinal axis of the cold mass.

4.3.9 Tack weld the end plates at their correct positions.

4.3.10 Perform electrical testing per Appendix 1.

4.3.11 Cognizant Electrical Engineer to review test data and sign-off "OK to proceed".

4.3.12 Complete the welding on each end volume plate.

4.3.13 Complete the longitudinal shell welds on either side and both ends.

4.3.14 Complete the welding of the last 5.5 inches on both sides of the two buffer volumes, and around the ends.

5 Quality Assurance Provisions

5.1.1 The Quality Assurance provisions of this procedure require that the technician be responsible for performing all assembly operations in compliance with the procedural instructions contained herein and the recording of the results on the production traveler.

5.1.2 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with RHIC-MAG-Q-1004.

5.1.3 Measuring and test equipment used for this procedure shall contain a valid calibration label in accordance with RHIC-MAG-Q-1000.

6 Preparation For Delivery

N/A

Appendix 1 - Electrical Testing

NOTE

Pay particular attention to safety requirements included in individual electrical test procedures.

- Measure coil temperature and RLQ for coil. Perform test in accordance with RHIC-MAG-R-7227 & RHIC-MAG-R-7228.

NOTE

If Coil has previously been cold tested, contact Cognizant Electrical Engineer before proceeding.

- Hypot all circuits EXCEPT Temperature Sensors and Level Probes at 800 Volts per RHIC- MAG-R-7242. Max acceptable leakage is 50 μA.

- Hypot Temperature Sensors and Level Probes at 50 Volts per RHIC- MAG-R-7242. Max acceptable leakage is 50 μA.